

TEST REPORT

Product: Wire USB Keyboard

Model No.: CK460, CK-420U, CK-460U, CK-480U, CK-601U, CK-600U, CK-480MU, CK-480H, CK-410U, CK-410LU, CK-430LU, CK-430U, K-430H, CK-460LU, CK-600L, CK-450U, CK-450UL, CK-440U, CK-440UL, CK-465U, CK-465UL, CK-400, CNS-HKB3

Trade mark: 创享 (CONSON) / 丹鹿 (DANLU) / 鹰蝠 (EABAT) / 肯杨 (CANYON)

Report No.: TCT160725E008

Issued Date: Jul. 29, 2016

Issued for:

Dongguan Couso Technology Co., Ltd

26 Minye Road, Tangxia Town, Dongguan

Issued By:

Shenzhen TCT Testing Technology Co., Ltd.

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1. Test Certification

Product:	Wire USB Keyboard
Model No.:	CK460, CK-420U, CK-460U, CK-480U, CK-601U, CK-600U, CK-480MU, CK-480H, CK-410U, CK-410LU, CK-430LU, CK-430U, K-430H, CK-460LU, CK-600L, CK-450U, CK-450UL, CK-440U, CK-440UL, CK-465U, CK-465UL, CK-400, CNS-HKB3
Applicant:	Dongguan Couso Technology Co., Ltd
Address:	26 Minye Road, Tangxia Town, Dongguan
Manufacturer:	Dongguan Couso Technology Co., Ltd
Address:	26 Minye Road, Tangxia Town, Dongguan
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)
Date of Test:	Jul. 26, 2016-Jul. 28, 2016
Applicable Standards:	EN 55022: 2010+AC: 2011 EN 55024: 2010+A1: 2015 EN 61000-3-2: 2014 EN 61000-3-3: 2013

The above equipment has been tested by Shenzhen TCT Testing Technology Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:


Derek Cai

Date:

Jul. 28, 2016

Check By:


Joe Zhou

Date:

Jul. 29, 2016

Approved By:


Tomsin

Date:

Jul. 29, 2016



2. Test Result Summary

Emission		
Test Method	Item	Result
EN 55022: 2010+ AC: 2011	Conducted Emission at Mains Terminals	Pass
	Conducted Emission at Telecommunication Ports	N/A
	Radiated Emission	Pass
EN 61000-3-2: 2014	Harmonic Current Emissions	N/A
EN 61000-3-3: 2013	Voltage Fluctuations & Flicker	N/A

Immunity (EN 55024: 2010+A1: 2015)		
Test Method	Item	Result
EN 61000-4-2: 2009	Electrostatic Discharge (ESD)	Pass
EN 61000-4-3: 2006 +A1: 2008+A2: 2010	Radio-frequency Electromagnetic Field Amplitude Modulated (RS)	Pass
EN 61000-4-4: 2012	Electrical Fast Transients (EFT)	Pass
EN 61000-4-5: 2014	Surges	Pass
EN 61000-4-6: 2014	Radio-frequency Continuous Conducted (CS)	Pass
EN 61000-4-8: 2010	Power-frequency Magnetic Fields (PFMF)	N/A
EN 61000-4-11: 2004	Voltage Dips & Voltage Interruptions	Pass

Note:

1. Pass: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.
5. The information of measurement uncertainty is available upon the customer's request.

3. EUT Description

Product Name:	Wire USB Keyboard
Model No.:	CK460
Product Parameter:	Input: DC 5 V, 0.3 A
AC Mains:	<input type="checkbox"/> Shielded <input type="checkbox"/> Unshielded, <input type="checkbox"/> Detachable <input type="checkbox"/> Un-detachable <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Length:
DC Line:	<input type="checkbox"/> Shielded <input type="checkbox"/> Unshielded, <input type="checkbox"/> Detachable <input type="checkbox"/> Un-detachable <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Length:
USB Line:	<input type="checkbox"/> Shielded <input checked="" type="checkbox"/> Unshielded, <input type="checkbox"/> Detachable <input checked="" type="checkbox"/> Un-detachable <input type="checkbox"/> Not applicable <input checked="" type="checkbox"/> Length: 1.5 m

Model(s) List

No.	Model Number	Tested With
1	CK460	<input checked="" type="checkbox"/>
Other models	CK-420U, CK-460U, CK-480U, CK-601U, CK-600U, CK-480MU, CK-480H, CK-410U, CK-410LU, CK-430LU, CK-430U, K-430H, CK-460LU, CK-600L, CK-450U, CK-450UL, CK-440U, CK-440UL, CK-465U, CK-465UL, CK-400, CNS-HKB3	<input type="checkbox"/>

Note: CK460 is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of CK460 can represent the remaining models.

4. Test Methodology

4.1. Decision of Final Test Mode

The EUT was tested together with the thereafter additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The following test mode(s) were assessed:

Test Mode
Mode 1: Normal Operation

4.2. EUT System Operation

1. Set up EUT with the support equipments.
2. Make sure the EUT work normally during the test.

5. Setup of Equipment under Test

5.1. Description of Support Units

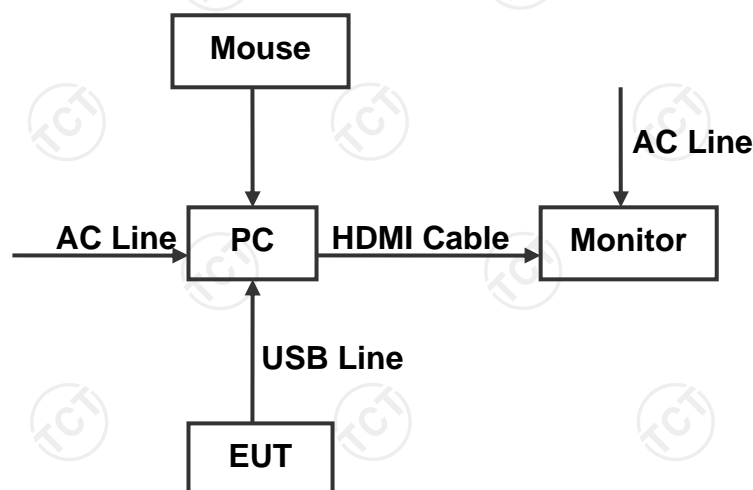
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
PC	BM6620	D1PFCG0008 HP	/	ASUS
Monitor	19PFL3120/T3	AU2A1241000 762	/	PHILLIPS
Mouse	MOBTUO	04G12561017 0DP	/	ASUS

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. Configuration of System Under Test



(EUT: Wire USB Keyboard)

6. Facilities and Accreditations

6.1. Facilities

All measurement facilities used to collect the measurement data are located at TCT Lab.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

No.	Item	MU
1.	Temperature	$\pm 0.1^{\circ}\text{C}$
2.	Humidity	$\pm 1.0\%$
3.	Spurious Emissions, Conducted	$\pm 2.56\text{ dB}$
4.	All Emissions, Radiated	$\pm 4.50\text{ dB}$

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

7. Emission Test

7.1. Conducted Emission at Mains Terminals

7.1.1. Test Specification

Test Requirement:	EN 55022
Test Method:	EN 55022
Frequency Range:	150 kHz to 30 MHz

7.1.2. Limits

Frequency (MHz)	Class A dB(uV)		Class B dB(uV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

7.1.3. Test Instruments

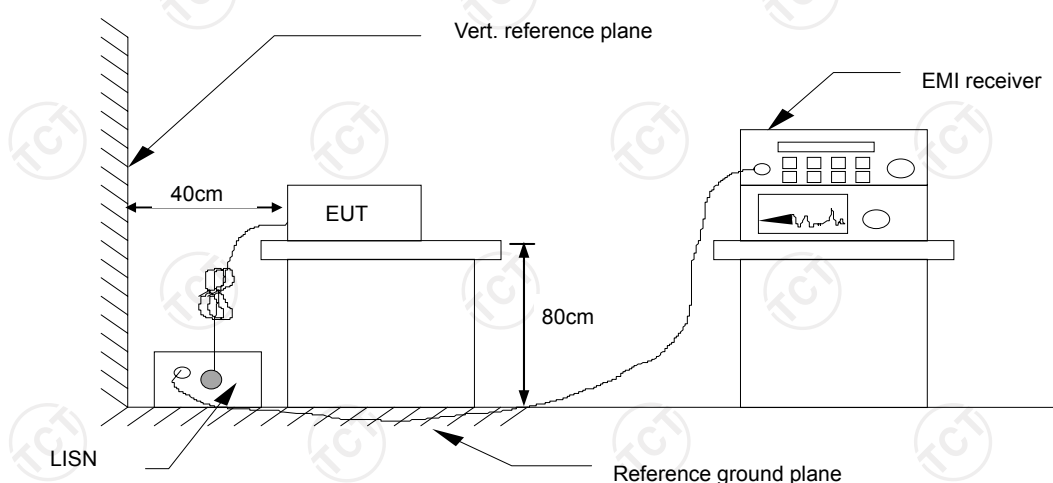
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Sep. 11, 2016
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 16, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.1.4. Test Method

The AMN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.

7.1.5. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.6. Test Results

Test Environment:	Temp.: 25 °C	Humid.: 54 %	Press.: 96 kPa
Test Mode:	Mode 1		
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)		
Test Result:	Pass		

Note:

L1 = Live Line / N = Neutral Line

“---” denotes the emission level was or more than 2 dB below the Average limit, so no re-check anymore.

Freq. = Emission frequency in MHz

Reading level dB(μV) = Receiver reading

Corr. Factor (dB) = Attenuator factor + Cable loss

Level dB(μV) = Reading level dB(μV) + Corr. Factor (dB)

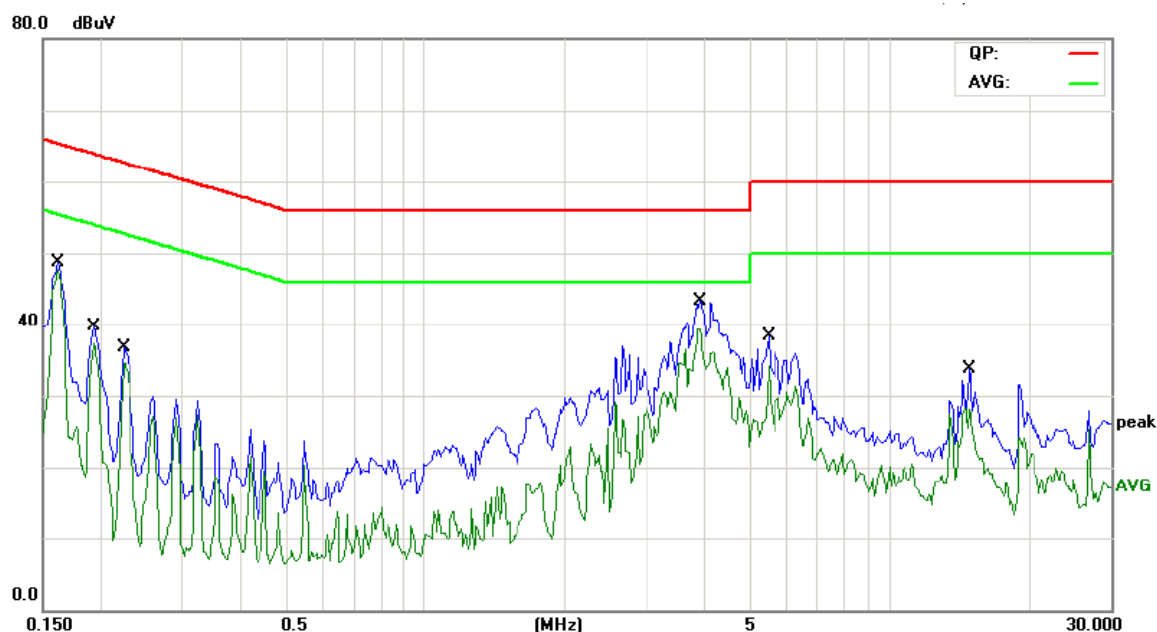
Limit dB(μV) = Limit stated in standard

Margin (dB) = Level dB(μV) – Limits dB(μV)

Q.P. =Quasi-Peak

AVG=Average

Please refer to following diagram for individual



Site Chamber #2

Phase: **L1**

Temperature: 25 (C)

Limit: EN55022 Class B Conduction(QP)

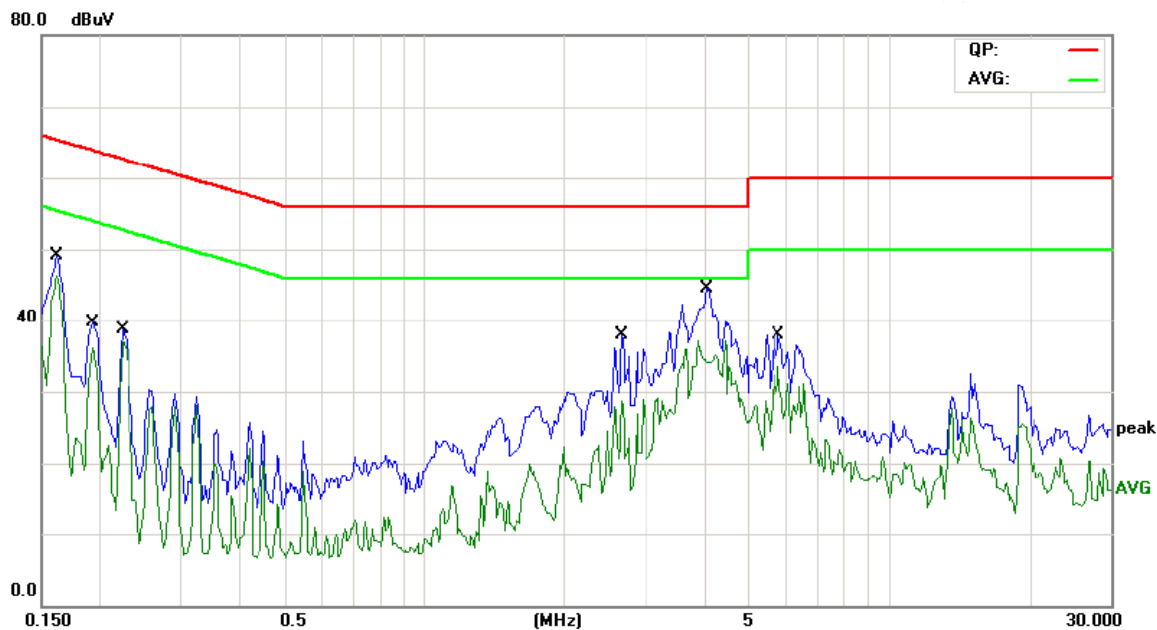
Power:

Humidity: 54 %

Mode: Normal Operation

Note: DC 5V(PC Input AC 230V/50Hz)

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1617	35.89	11.51	47.40	65.37	-17.97	QP	
2	*	0.1617	34.63	11.51	46.14	55.37	-9.23	AVG	
3		0.1930	26.79	11.48	38.27	63.90	-25.63	QP	
4		0.1930	24.95	11.48	36.43	53.90	-17.47	AVG	
5		0.2242	23.44	11.47	34.91	62.66	-27.75	QP	
6		0.2242	22.87	11.47	34.34	52.66	-18.32	AVG	
7		3.9102	27.94	11.01	38.95	56.00	-17.05	QP	
8		3.9102	20.92	11.01	31.93	46.00	-14.07	AVG	
9		5.4805	20.41	10.69	31.10	60.00	-28.90	QP	
10		5.4805	12.61	10.69	23.30	50.00	-26.70	AVG	
11		14.8828	18.43	11.66	30.09	60.00	-29.91	QP	
12		14.8828	11.81	11.66	23.47	50.00	-26.53	AVG	



Site Chamber #2

Phase: **N**

Temperature: 25 (C)

Limit: EN55022 Class B Conduction(QP)

Power:

Humidity: 54 %

Mode: Normal Operation

Note: DC 5V(PC Input AC 230V/50Hz)

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1617	36.13	11.51	47.64	65.37	-17.73	QP	
2	*	0.1617	35.04	11.51	46.55	55.37	-8.82	AVG	
3		0.1930	26.55	11.48	38.03	63.90	-25.87	QP	
4		0.1930	24.88	11.48	36.36	53.90	-17.54	AVG	
5		0.2242	25.26	11.47	36.73	62.66	-25.93	QP	
6		0.2242	24.79	11.47	36.26	52.66	-16.40	AVG	
7		2.6617	23.91	11.45	35.36	56.00	-20.64	QP	
8		2.6617	17.90	11.45	29.35	46.00	-16.65	AVG	
9		4.0703	25.23	10.95	36.18	56.00	-19.82	QP	
10		4.0703	17.89	10.95	28.84	46.00	-17.16	AVG	
11		5.7852	20.90	10.75	31.65	60.00	-28.35	QP	
12		5.7852	11.81	10.75	22.56	50.00	-27.44	AVG	

7.2. Conducted Emission at Telecommunication Ports

7.2.1. Test Specification

Test Requirement:	EN 55022
Test Method:	EN 55022
Frequency Range:	150 kHz to 30 MHz

7.2.2. Limits

Frequency (MHz)	Voltage limits Class A dB(uV)		Current limits Class A dB(uA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 - 87	84 - 74	53 - 43	40 - 30
0.5 - 30.0	87	74	43	30

Frequency (MHz)	Voltage limits Class B dB(uV)		Current limits Class B dB(uA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74	74 - 64	40 - 30	30 - 20
0.5 - 30.0	74	64	30	20

Note:

1. The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.
2. The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is $20 \log_{10} 150 / I = 44$ dB).

7.2.3. Test Instruments

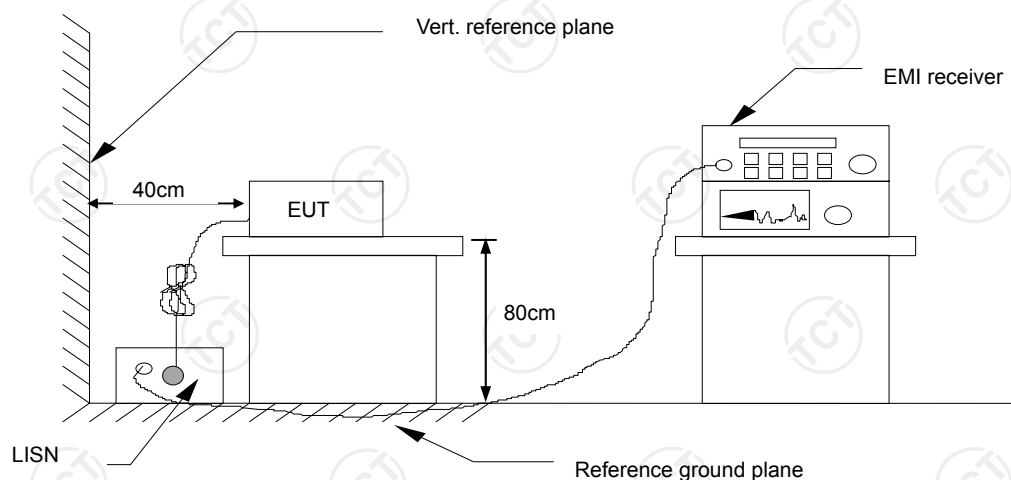
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESCS30	100139	Sep. 11, 2016
ISN	R&S	ENY81	100054	Sep. 11, 2016
ISN	R&S	ENY81-CA6	101564	Sep. 11, 2016
Current probe	Schwarzbeck	F-33-2	427	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.2.4. Test Method

All power was connected to the system through Artificial Mains Network (AMN). All tested telecommunications lines were connected to an Impedance Stabilization Network (ISN) and conducted voltage measurements on telecommunications lines were made at the output of the ISN. Where an ISN was not appropriate or available measurements were made using a Capacitive Voltage Probe and Current probe.

7.2.5. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.6. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

7.3. Radiated Emission

7.3.1. Test Specification

Test Requirement:	EN 55022
Test Method:	EN 55022
Frequency Range:	30 MHz to 1000 MHz
Measurement Distance:	3 m
Antenna Polarization:	Horizontal & Vertical

7.3.2. Limits

Below 1 GHz

Frequency (MHz)	dB(uV/m) (At 3m)	dB(uV/m) (At 3m)
	Class A	Class B
30 - 230	50	40
230 - 1000	57	47

Note: 1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

Above 1 GHz

Frequency (GHz)	Class A		Class B	
	Average dB(uV/m)	Peak dB(uV/m)	Average dB(uV/m)	Peak dB(uV/m)
1 - 3	56	76	50	70
3 - 6	60	80	54	74

Note: The lower limit shall apply at the transition frequency.

7.3.3. Test Instruments

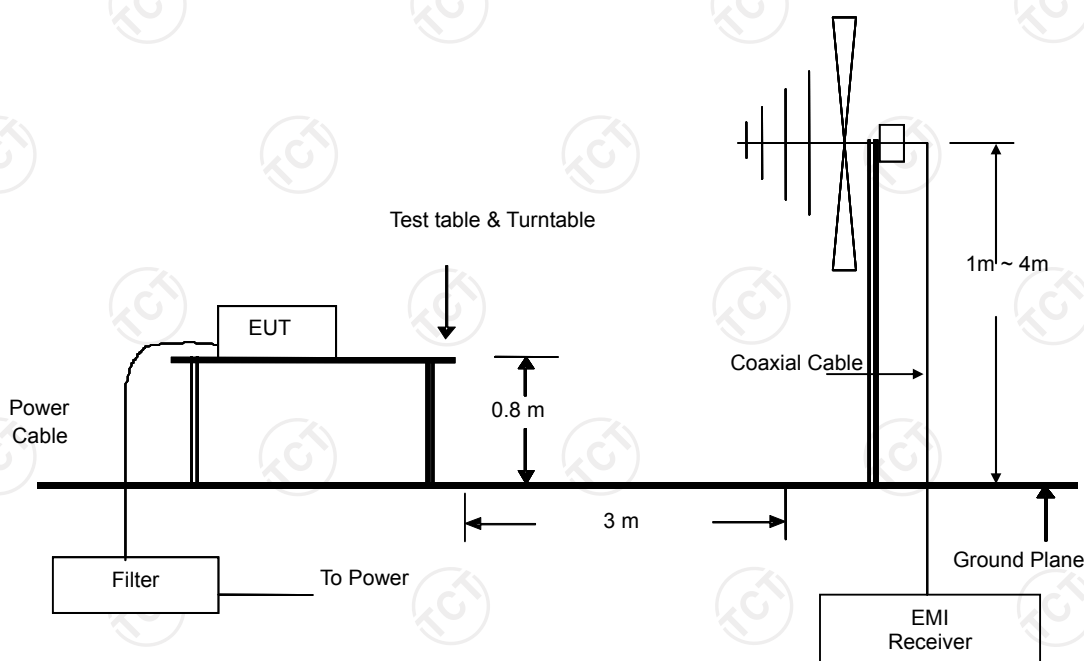
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESVD	100008	Sep. 11, 2016
Spectrum Analyzer	R&S	FSEM	848597-001	Sep. 11, 2016
Amplifier	HP	8447D	2727A05017	Sep. 11, 2016
Amplifier	EM	EM30265	07032613	Sep. 11, 2016
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 13, 2016
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 13, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.3.4. Test Method

Measurements were made in a 3-meter semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable. Block Diagram of Test Setup.

7.3.5. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.3.6. Test Results

Test Environment:	Temp.: 25 °C Humid.: 54 % Press.: 96 kPa
Test Mode:	Mode 1
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)
Test Result:	Pass

Note:

Freq. = Emission frequency in MHz

Reading level dB(μV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

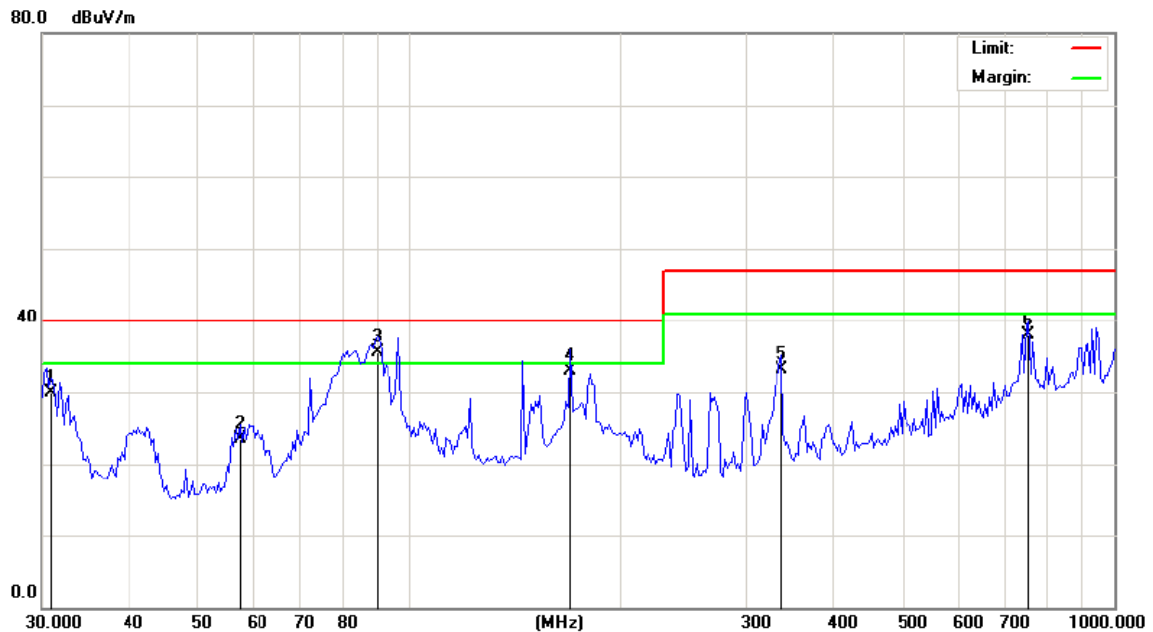
Measurement dB(μV/m) = Reading level dB(μV) + Corr. Factor (dB)

Limit dB(μV/m) = Limit stated in standard

Margin (dB) = Measurement dB(μV/m) – Limits dB(μV/m)

Q.P. =Quasi-Peak

Please refer to following diagram for individual



Site

Polarization: **Horizontal**

Temperature: 25

Limit: EN 55022 Class B RE_3 M

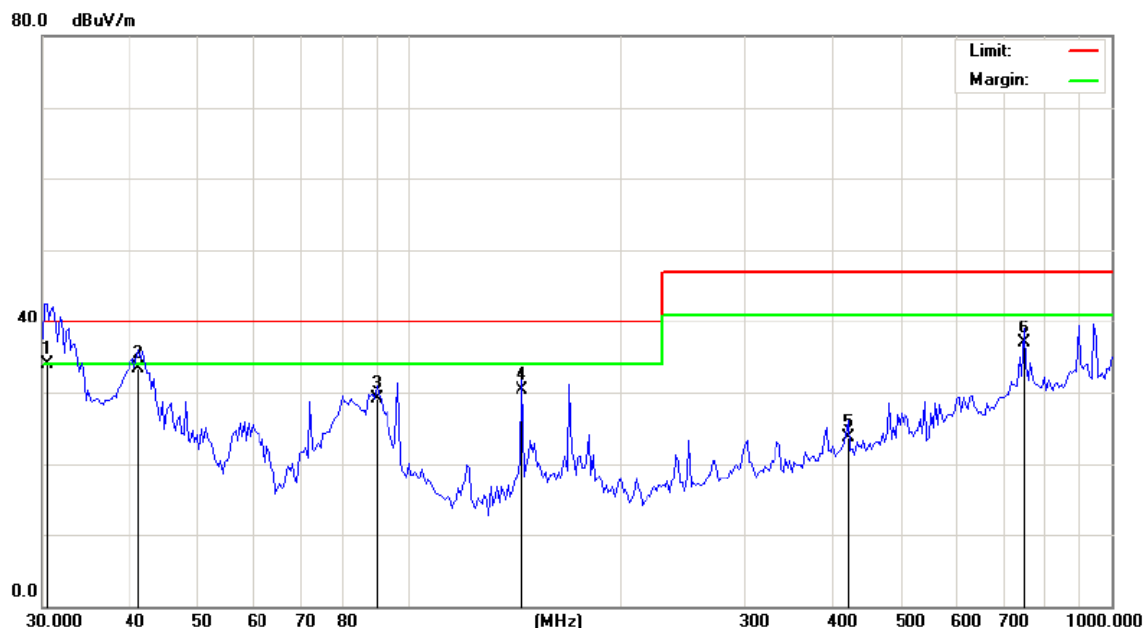
Power:

Humidity: 54 %

Mode: Normal Operation

Note: DC 5V(PC Input AC 230V/50Hz)

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		30.8552	43.33	-13.40	29.93	40.00	-10.07	QP		0
2		57.2654	34.40	-10.98	23.42	40.00	-16.58	QP		0
3	*	89.7866	49.02	-13.45	35.57	40.00	-4.43	QP		0
4		168.9970	47.05	-14.10	32.95	40.00	-7.05	QP		0
5		336.4817	40.25	-7.13	33.12	47.00	-13.88	QP		0
6		754.9628	33.16	4.72	37.88	47.00	-9.12	QP		0



Site

Polarization: **Vertical**

Temperature: 25

Limit: EN 55022 Class B RE_3 M

Power:

Humidity: 54 %

Mode: Normal Operation

Note: DC 5V(PC Input AC 230V/50Hz)

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1	*	30.4246	47.30	-13.31	33.99	40.00	-6.01	QP	0	
2		41.1581	44.22	-10.93	33.29	40.00	-6.71	QP	0	
3		89.7866	42.51	-13.45	29.06	40.00	-10.94	QP	0	
4		144.7900	46.79	-16.47	30.32	40.00	-9.68	QP	0	
5		421.3287	28.21	-4.59	23.62	47.00	-23.38	QP	0	
6		749.6761	32.20	4.78	36.98	47.00	-10.02	QP	0	

7.4. Harmonic Current Emissions

7.4.1. Test Specification

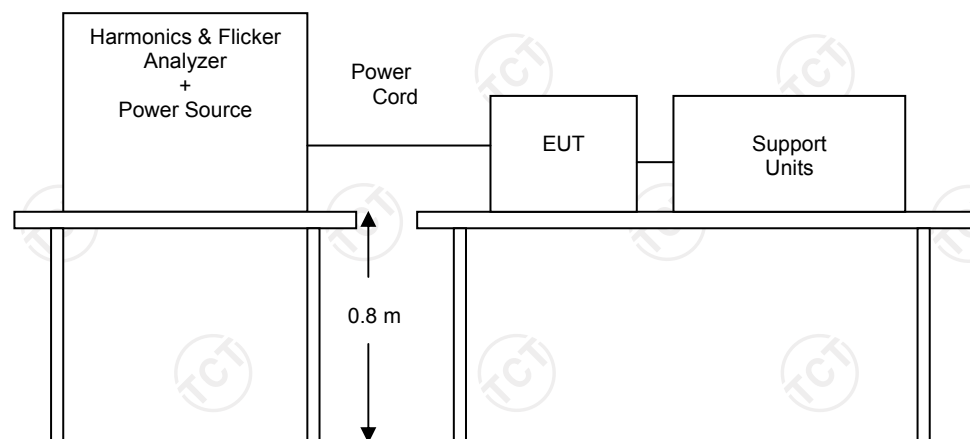
Test Requirement:	EN 61000-3-2
Test Method:	EN 61000-3-2
Limits:	Class A

7.4.2. Test Instruments

Harmonic Test Equipment				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
AC Power Supply	KIKUSUI	PCR4000M	UC002552	Sep. 11, 2016
Harmonic/Flicker Analyzer	KIKUSUI	KHA1000	UD002324	Sep. 11, 2016
Multi Outlet Unit	KIKUSUI	OT01-KHA	UF003026	Sep. 11, 2016
Line Impedance Network	KIKUSUI	LIN1020JF	UC001738	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.4.3. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.4.4. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

7.5. Flicker and Voltage Fluctuation

7.5.1. Test Specification

Test Requirement:	EN 61000-3-3
Test Method:	EN 61000-3-3

7.5.2. Limits

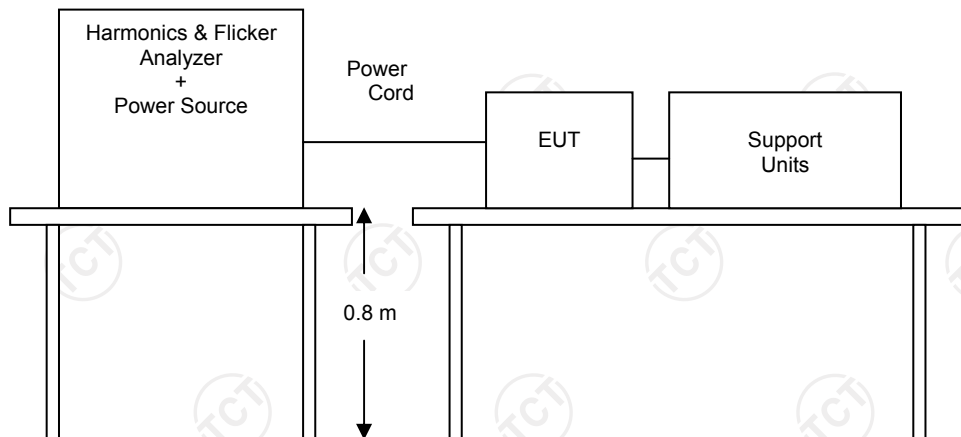
Test Item	Limit	Note
Pst	1.0	Pst means short-term flicker indicator
Plt	0.65	Plt means long-term flicker indicator
Tdt (ms)	500	Tdt means maximum time that dt exceeds 3 %.
dmax (%)	4/6/7	Dmax means maximum relative voltage change.
dc (%)	3.3	Dc means relative steady-state voltage change.

7.5.3. Test Instruments

Flicker Test Equipment				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
AC Power Supply	KIKUSUI	PCR4000M	UC002552	Sep. 11, 2016
Harmonic/Flicker Analyzer	KIKUSUI	KHA1000	UD002324	Sep. 11, 2016
Multi Outlet Unit	KIKUSUI	OT01-KHA	UF003026	Sep. 11, 2016
Line Impedance Network	KIKUSUI	LIN1020JF	UC001738	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

7.5.4. Block Diagram of Test Setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.5.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8. Immunity Test

8.1. General Performance Criteria Description

Criterion A:	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
Criterion B:	<p>After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance.</p> <p>During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.</p> <p>If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.</p>
Criterion C:	<p>Temporary loss of function is allowed, provided the functions is self-recoverable or can be restored by the operation of controls by the user in accordance with the manufacturer instructions.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

8.2. Electrostatic Discharge (ESD)

8.2.1. Test Specification

Test Requirement:	EN 55024
Test Method:	EN 61000-4-2
Storage capacitor:	150 pF
Discharge resistor:	330 ohm
Discharge Voltage:	Contact Discharge: ± 4 kV Air Discharge: ± 8 kV Indirect application: ± 4 kV
Polarity:	Positive & Negative
Number of Discharge:	Least 100 each at negative and positive polarity
Discharge Mode:	1 time/s
Performance Criterion:	B

8.2.2. Test Instruments

Immunity Shielded Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Electrostatic Discharge Generator	Prima	ESD61002AG	PR12092502	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.2.3. Test Method

1. Air Discharge:

The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 20 times for each pre-selected test point. This Method was repeated until all the air discharge completed.

2. Contact Discharge:

The test was applied on accessible metallic parts of the EUT. The generator was re-triggered for a new single discharge and repeated 50 times for each pre-selected test point. The tip of the discharge electrode was touching the EUT before the discharge switch was operated.

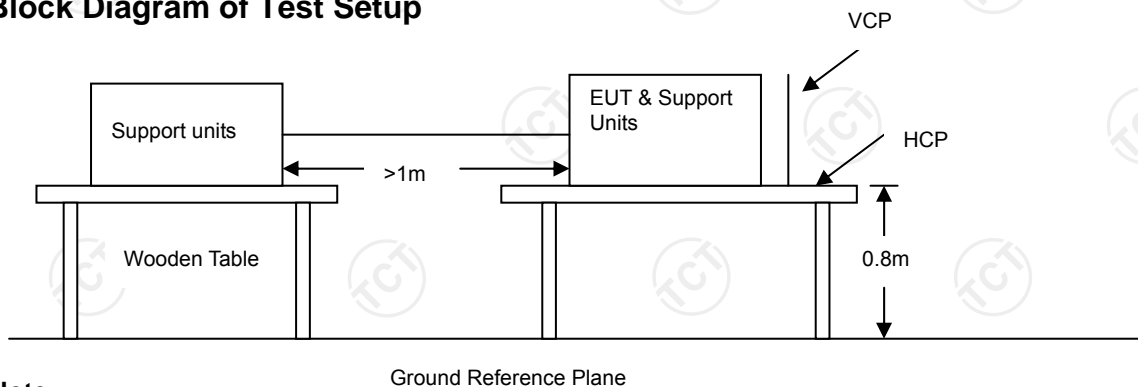
3. Indirect discharge for horizontal coupling plane:

At least 10 single discharges (in the most sensitive polarity) were applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1 m from the EUT and with the discharge electrode touching the coupling plane.

4. Indirect discharge for vertical coupling plane:

At least 10 single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5 m X 0.5 m, was placed parallel to, and positioned at a distance of 0.1 m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

8.2.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25 mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6 m x 0.8 m) was placed on the table and attached to the **GRP** by means of a cable with 940 k total impedance.

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5 mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

2. Floor-standing Equipment

The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25 mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

8.2.5. Test Results

Test Environment:	Temp.:	25 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)					
Test Result:	Pass					

Air Discharge					
Test Points	Test Levels	Results			
	± 8 kV	Pass	Fail	Performance Criterion	Observation
GAP 4 Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
USB Port 1 Point	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3

Contact Discharge					
Test Points	Test Levels	Results			
	± 4 kV	Pass	Fail	Performance Criterion	Observation
HCP 4 Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
VCP 4 Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3

Note:

1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. The function stopped during the test, but can be recoverable by itself operation after the test.
3. The function stopped during the test, but can be recoverable manually after the test.

8.3. Radio-frequency Electromagnetic Field Amplitude Modulated (RS)

8.3.1. Test Specification

Test Requirement:	EN 55024
Test Method	EN 61000-4-3
Frequency Range:	80 MHz -1000 MHz
Test level:	3 V/m (unmodulated, r.m.s)
Modulation:	1 kHz, 80 % AM, sine wave
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal & Vertical
Antenna Height:	1.5 m
Performance Criterion:	A

8.3.2. Test Instruments

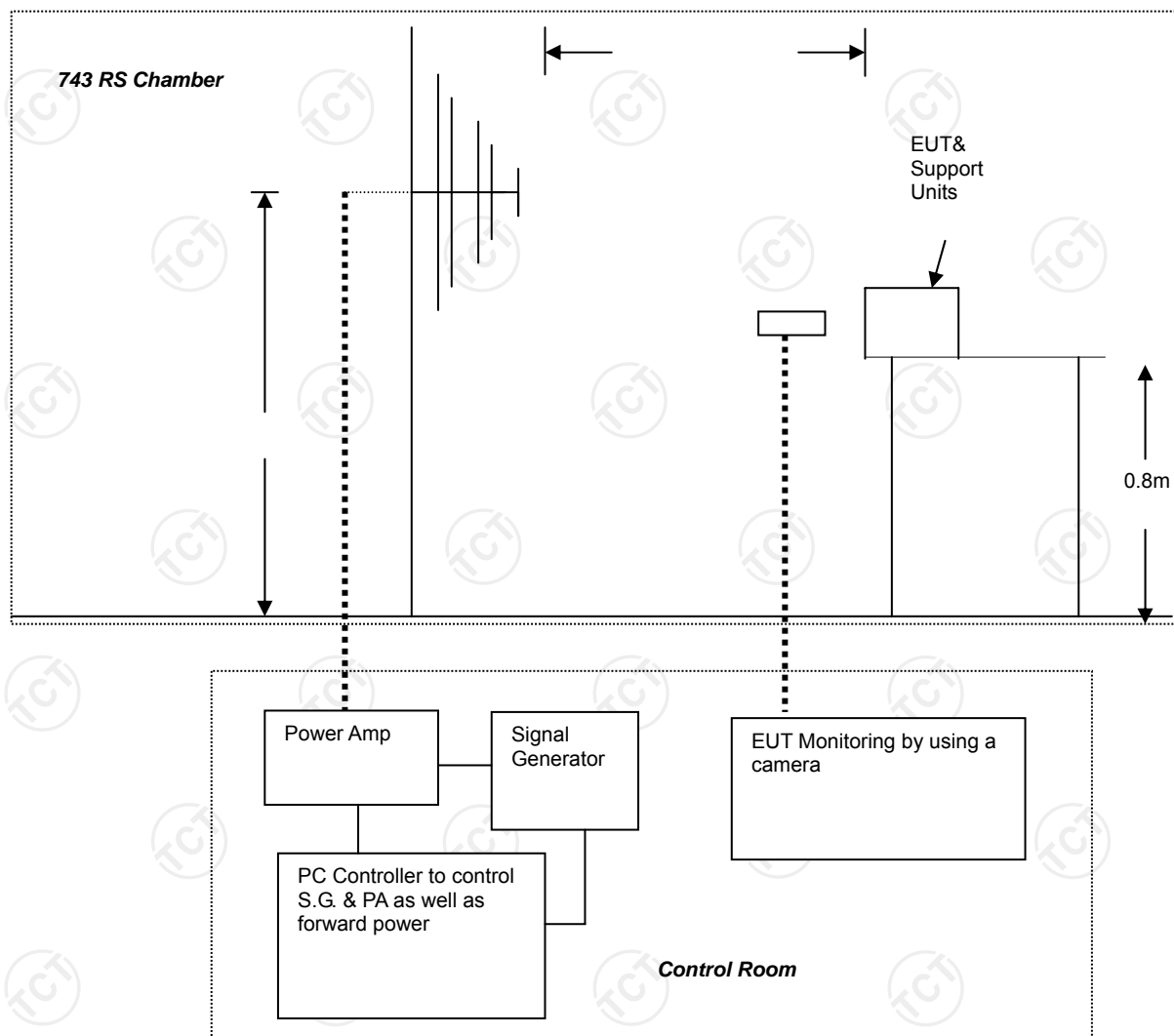
743 RS Chamber				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	Maconi	2022D	119246/003	Sep. 11, 2016
Power Amplifier	M2S	A00181-1000	9801-112	Sep. 11, 2016
Power Amplifier	M2S	AC8113/ 800-250A	9801-179	Sep. 11, 2016
Power Antenna	SCHAFFNER	CBL6140A	1204	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.3.3. Test Method

1. The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
2. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1 kHz sine-wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s, where the frequency range is swept incrementally; the step size was 1% of preceding frequency value.
3. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond and was not less than 0.5 s.
4. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.
5. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to monitor the performance of the EUT.

8.3.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

2. Floor-standing Equipment

The EUT installed in a representative system as described in section 7 of IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

8.3.5. Test Results

Test Environment:	Temp.:	25 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)					
Test Result:	Pass					

Frequency(MHz)	Polarity	Position	Field Strength(V/m)	Observation
80 ~ 1000	V&H	Front	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
80 ~ 1000	V&H	Rear	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
80 ~ 1000	V&H	Left	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
80 ~ 1000	V&H	Right	3	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3

Note:

1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. The function stopped during the test, but can be recoverable by itself operation after the test.
3. The function stopped during the test, but can be recoverable manually after the test.

8.4. Electrical Fast Transient (EFT)

8.4.1. Test Specification

Test Requirement:	EN 55024
Test Method:	EN 61000-4-4
Test Level:	signal ports and telecommunication ports: ± 0.5 kV (peak) input d.c. power port: ± 0.5 kV (peak) input a.c. power ports: ± 1 kV (peak)
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	2 minutes per level & polarity
Performance Criterion:	B

8.4.2. Test Instruments

Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Fast Transient Burst Simulator	Prima	EFT61004BG	PR12074375	Sep. 11, 2016
Capacitive coupling folder	Prima	EFT-CLAMP	N/A	Sep. 11, 2016
Single-phase transformer	Prima	JMB-3KVA	L12121902-2	Sep. 11, 2016

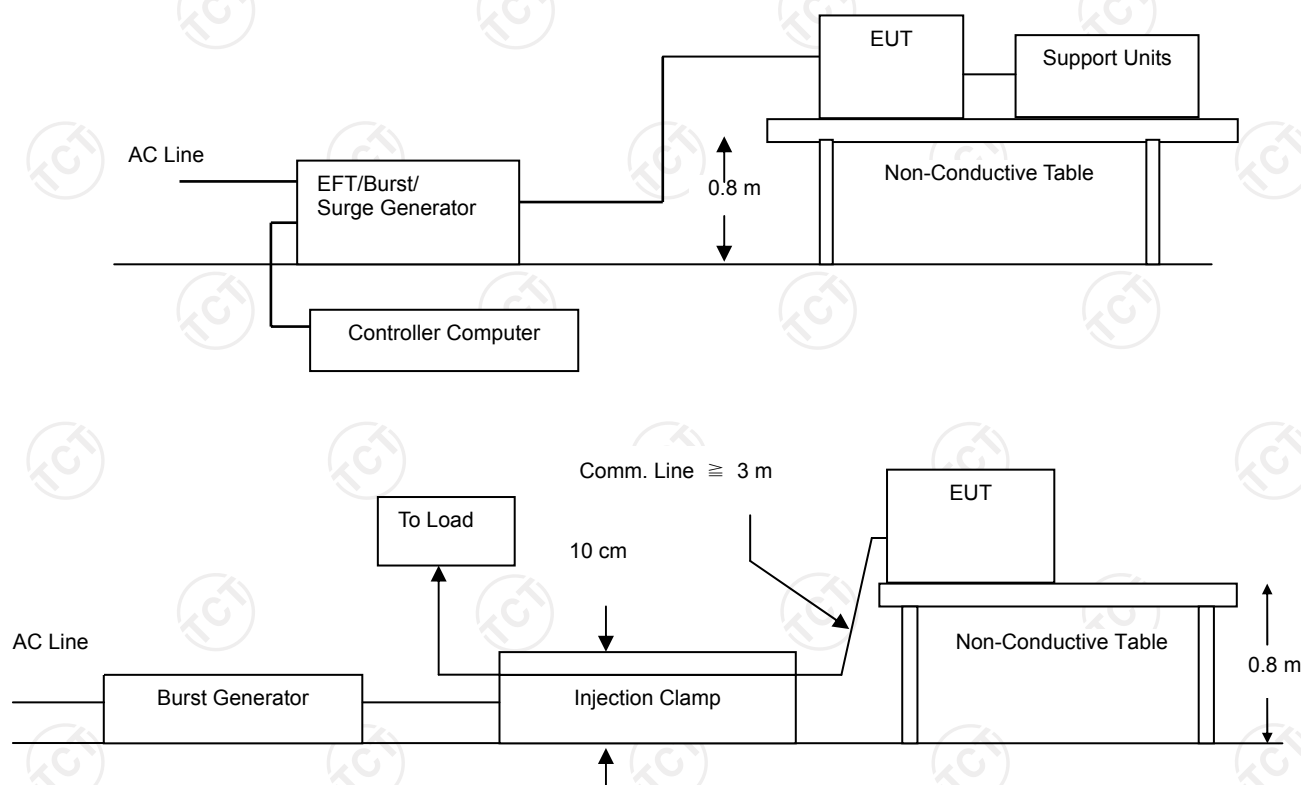
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.4.3. Test Method

1. The EUT and its simulators were placed on the ground reference plane and were insulated from it by a wood support 0.1 m + 0.01 m thick. The ground reference plane was 1 m*1 m metallic sheet with 0.65 mm minimum thickness.
2. This reference ground plane was project beyond the EUT by at least 0.1 m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5 m.
3. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.

4. The length of the signal and power lines between the coupling device and the EUT is 0.5 m.
5. The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.
6. Each of the Line and Neutral conductors is impressed with burst noise for 2 minutes.

8.4.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The configuration consisted of a wooden table (0.8 m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system. A minimum distance of 0.5 m was provided between the EUT and the walls of the laboratory or any other metallic structure.

2. Floor-standing Equipment

The EUT installed in a representative system as described in section 7 of IEC 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25 mm thick and 2.5 m square) connected to the protective grounding system.

8.4.5. Test Results

Test Environment:	Temp.:	25 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)					
Test Result:	Pass					

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation
L	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
N	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
L -N	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
L – PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
N – PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
L – N – PE	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
DC Port	--	--	--	N/A
telecommunication port	--	--	--	N/A
Signal port	--	--	--	N/A

Note:

1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. The function stopped during the test, but can be recoverable by itself operation after the test.
3. The function stopped during the test, but can be recoverable manually after the test.

8.5. Surges

8.5.1. Test Specification

Test Requirement:	EN 55024
Test Method:	EN 61000-4-5
Test Level:	signal ports and telecommunication ports: $\pm 1/4$ kV(peak) input d.c. power port: ± 0.5 kV (peak) input a.c. power ports: Line to line: ± 1 kV(peak) Line to ground: ± 2 kV(peak)
Polarity:	Positive & Negative
Wave-Shape:	1.2/50 us; 8 /20 us; 10 /700 us
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Test Interval:	60 s between each surge
Number of Tests:	5 positive, 5 negative at 0°, 90°, 180°, 270°.
Performance Criterion:	B&C

8.5.2. Test Instruments

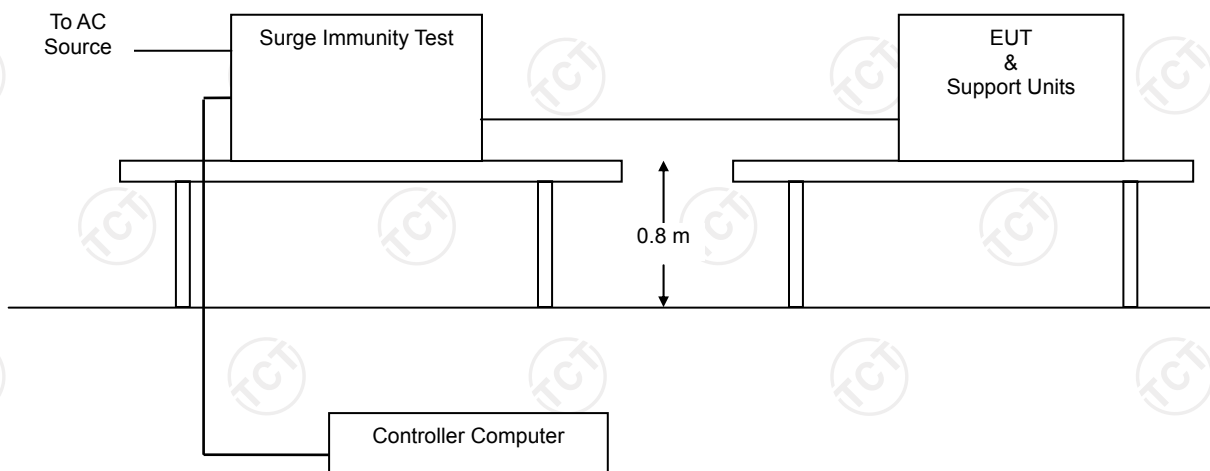
Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Lightning Surge Generator	Prima	SUG61005BG	PR12125534	Sep. 11, 2016
Single-phase transformer	Prima	JMB-3KVA	L12121902-2	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.5.3. Test Method

1. For line-to-line coupling mode, provide a 1 kV 1.2/50 us voltage surge (at open-circuit condition) and 8/20 us current surge to EUT selected points, and for active line / neutral lines to ground are same except test level is 2 kV.
2. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are applied during test.
3. Different phase angles are done individually.
4. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

8.5.4. Block Diagram of Test Setup



8.5.5. Test Results

Test Environment:	Temp.:	25 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)					
Test Result:	Pass					

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation
L - N	+/-	1	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
L - PE	+/-	2	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
N - PE	+/-	2	B	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
DC Port	--	--	--	N/A
telecommunication port	--	--	--	N/A
Signal port	--	--	--	N/A

Note:

1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. The function stopped during the test, but can be recoverable by itself operation after the test.
3. The function stopped during the test, but can be recoverable manually after the test.

8.6. Radio-frequency Continuous Conducted (CS)

8.6.1. Test Specification

Test Requirement:	EN 55024
Test Method	EN 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Test Level:	3 V r.m.s. (unmodulated)
Modulation:	1 kHz, 80 % AM, sine wave
Performance Criterion:	A

8.6.2. Test Instrument

CS Test				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conducted Disturbances Test System	Schloder	CDG 6000-75	126B1290	Sep. 12, 2016
CDN	Schloder	CDN M2+M3-16	A2210281	Sep. 16, 2016
Attenuator	Schloder	ATT-6DB-100	A100W225	Sep. 16, 2016
EM-Clamp	Schloder	EMCL-20	132A1194	Sep. 16, 2016

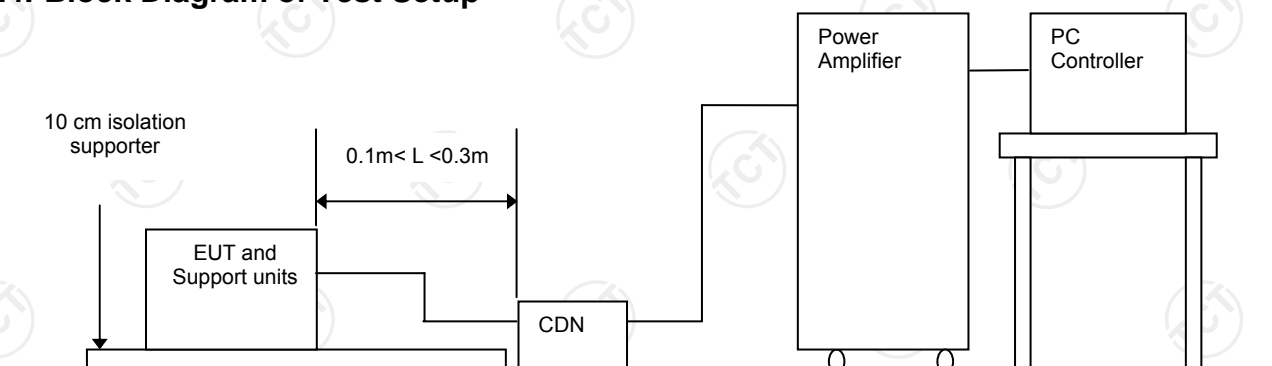
Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.6.3. Test Method

1. The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
2. The disturbance signal described below is injected to EUT through CDN.
3. The EUT operates within its operational mode(s) under intended climatic conditions after power on.
4. The frequency range is swept from 0.150 MHz to 80 MHz using 3 V signal level, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave.

5. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

8.6.4. Block Diagram of Test Setup



Note:

Table-Top and Floor-Standing Equipment

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

8.6.5. Test Results

Test Environment:	Temp.:	25 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)					
Test Result:	Pass					

Frequency Band (MHz)	Field Strength (Vrms)	Injected Position	Injection Method	Performance Criterion	Observation
0.15 ~ 80	3	AC Mains	CDN-M3	A	Note <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
0.15 ~ 80	--	--	--	--	N/A

Note:

- There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
- The function stopped during the test, but can be recoverable by itself operation after the test.
- The function stopped during the test, but can be recoverable manually after the test.

8.7. Power-frequency Magnetic Field (PFMF)

8.7.1. Test Specification

Test Requirement:	EN 55024
Test Method:	EN 61000-4-8
Frequency:	50/60 Hz
Test level:	1 A/m
Observation Time:	5 minutes
Performance criterion:	A

8.7.2. Test Instrument

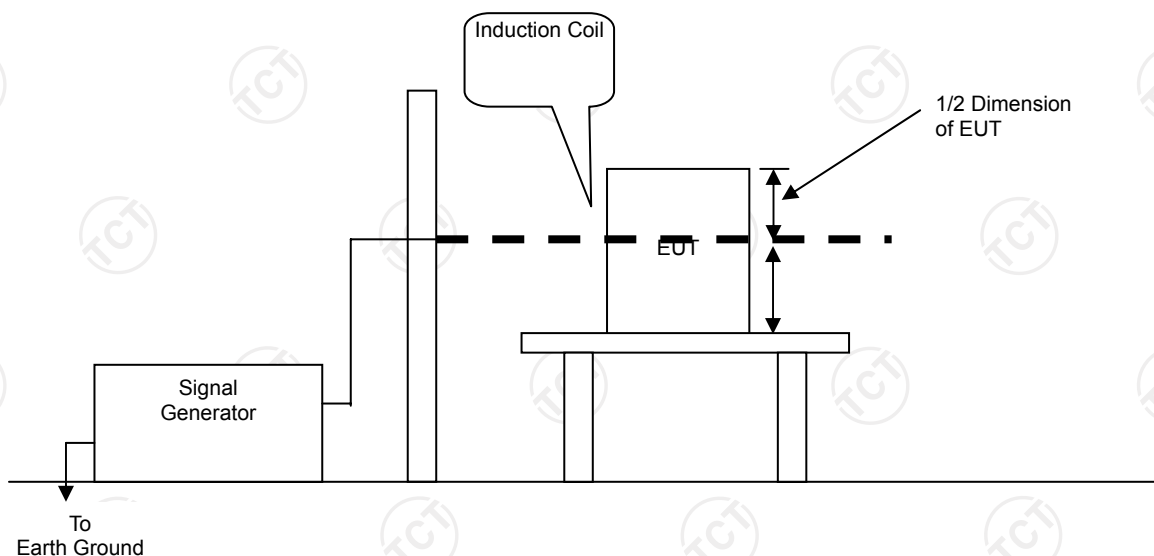
Immunity Shield Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Continuous Wave Simulator	EM TEST	UCS 500 M4	0304-42	Sep. 16, 2016
Power Source Network	EM TEST	MV 2616	0104-14	Sep. 16, 2016
Magnetic Coil	EM TEST	MS100	0304-42	Sep. 16, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.7.3. Test Method

1. the equipment is configured and connected to satisfy its functional requirements.
It shall be placed on the GRP with the interposition of a 0.1 m-thick insulating support.
2. the equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
3. the power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
4. the cables supplied or recommended by the equipment manufacturer shall be used.
1 meter of all cables used shall be exposed to the magnetic field.

8.7.4. Block Diagram of Test Setup



Note:

1. Table-top Equipment

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

2. Floor-standing Equipment

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

8.7.5. Test Results

Note: This test isn't applicable because the EUT doesn't have relative function.

8.8. Voltage Dip & Voltage Interruptions

8.8.1. Test Specification

Test Requirement:	EN 55024
Test Level:	>95 % of U_T (Supply Voltage) for 0.5 periods 30% of U_T (Supply Voltage) for 25 periods >95 % of U_T (Supply Voltage) for 250 periods
Performance Criterion:	B&C

8.8.2. Test Instrument

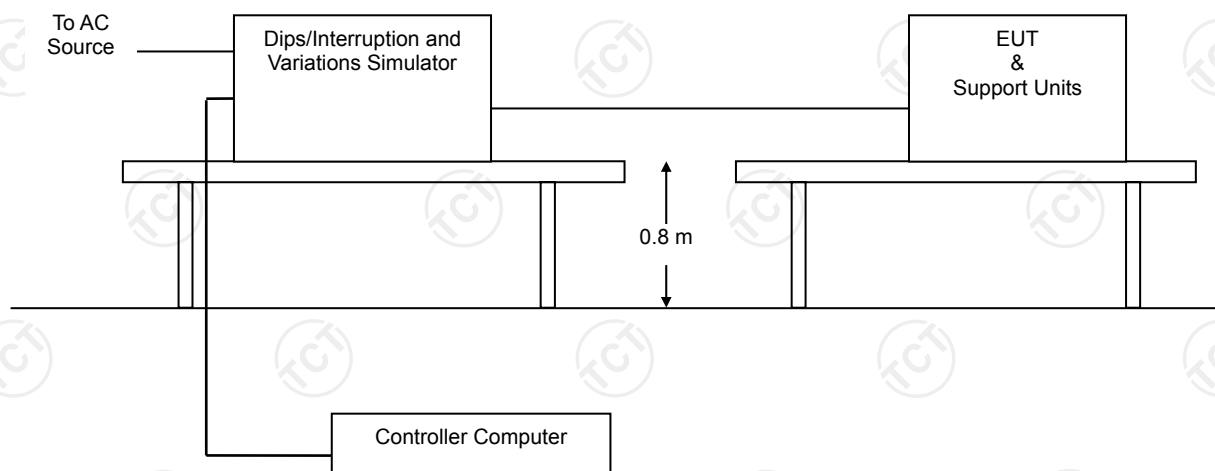
Immunity shielded room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Cycle Sag Simulator	Prima	DRP61011AG	PR12106201	Sep. 11, 2016
Single-phase transformer	Prima	JMB-3KVA	L12121902-2	Sep. 11, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

8.8.3. Test Method

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. Recording the test result in test record form.

8.8.4. Block Diagram of Test Setup



8.8.5. Test Results

Test Environment:	Temp.:	25 °C	Humid.:	54 %	Press.:	96 kPa
Test Mode:	Mode 1					
Test Voltage:	DC 5 V(PC Input AC 230 V/ 50 Hz)					
Test Result:	Pass					

Voltage (%Reduction)	Duration (cycle)	Performance Criterion	Observation
100	0.5	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C	Note <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3
70	25	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C	Note <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3
100	250	<input type="checkbox"/> A <input type="checkbox"/> B <input checked="" type="checkbox"/> C	Note <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3

Note:

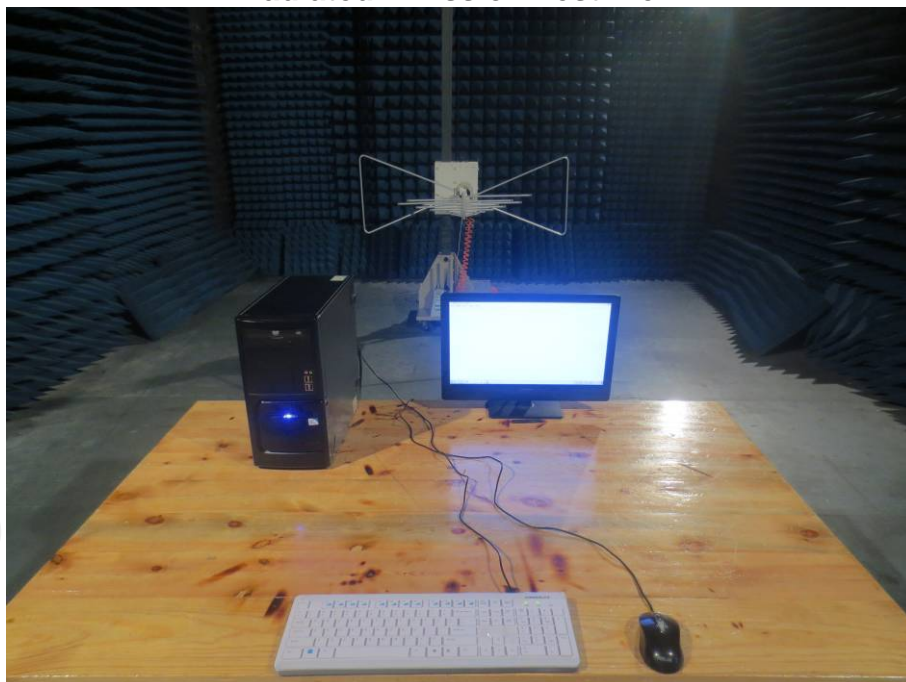
1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. The function stopped during the test, but can be recoverable by itself operation after the test.
3. The function stopped during the test, but can be recoverable manually after the test.

9. Photographs of Test Configuration

Conducted Emission Test View



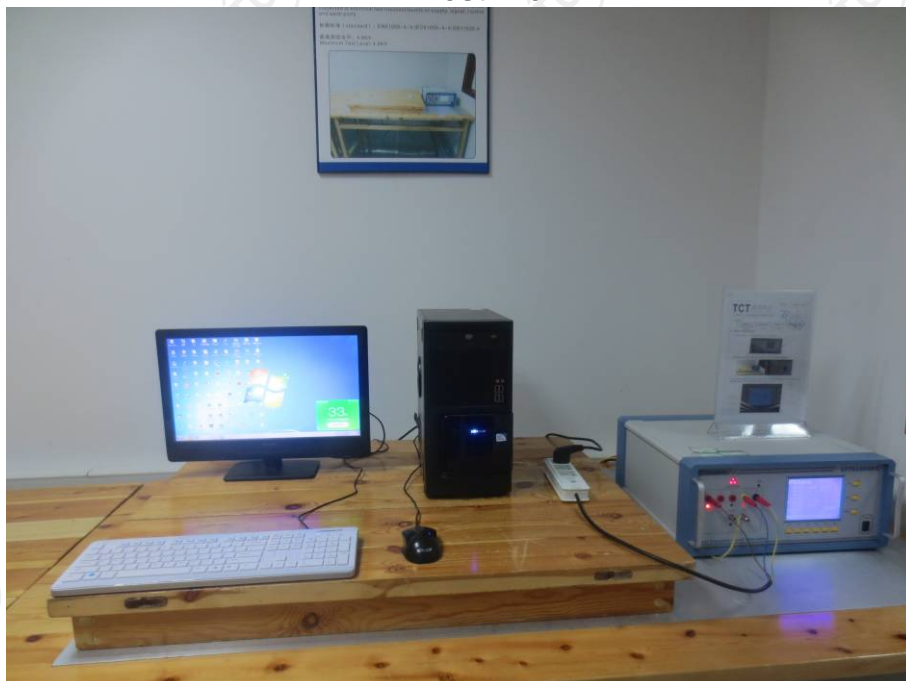
Radiated Emission Test View



ESD Test View



EFT Test View



Surges Test View



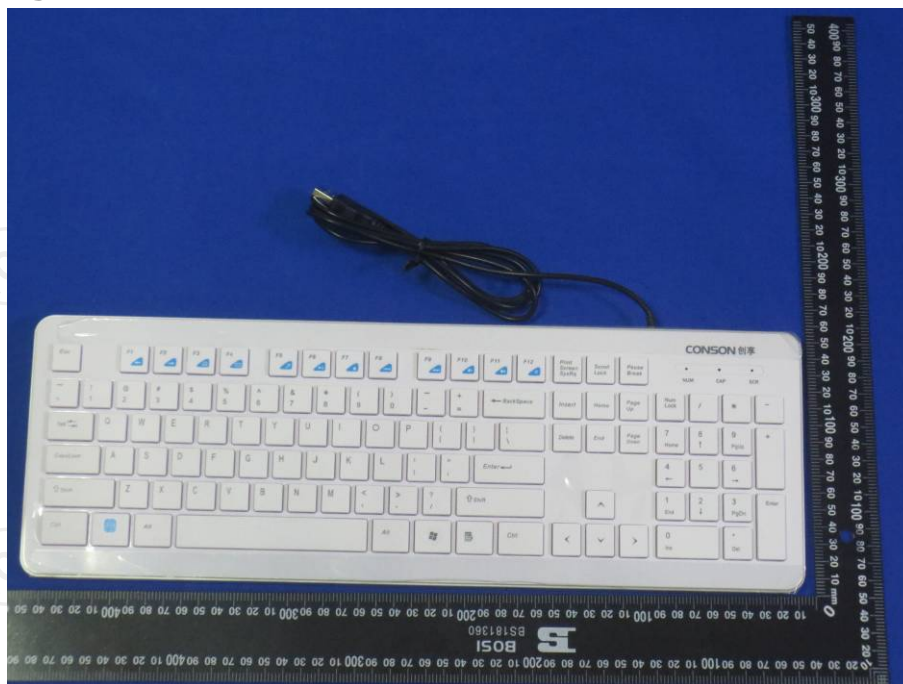
CS Test View

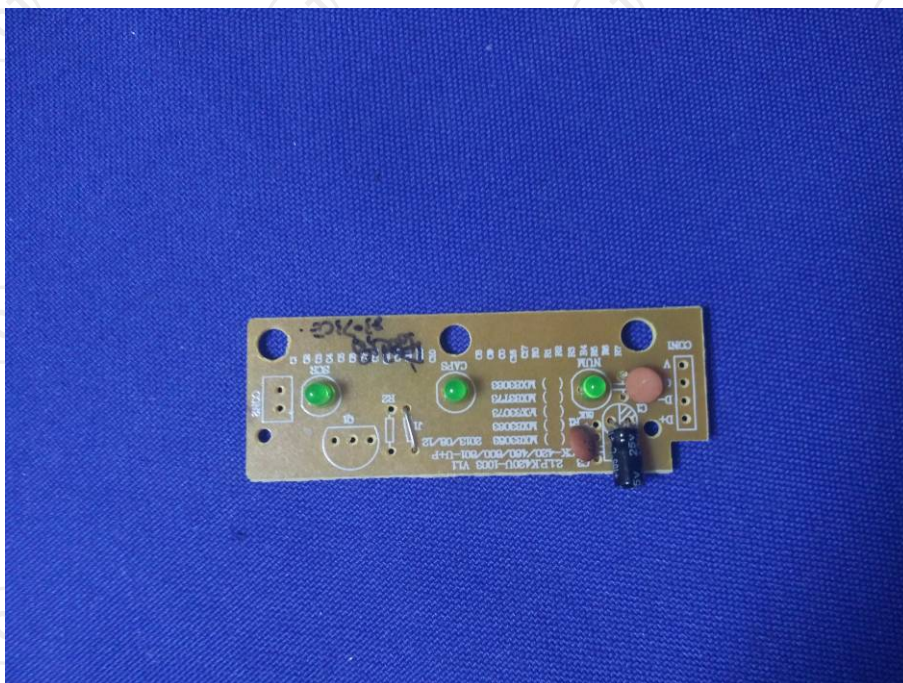


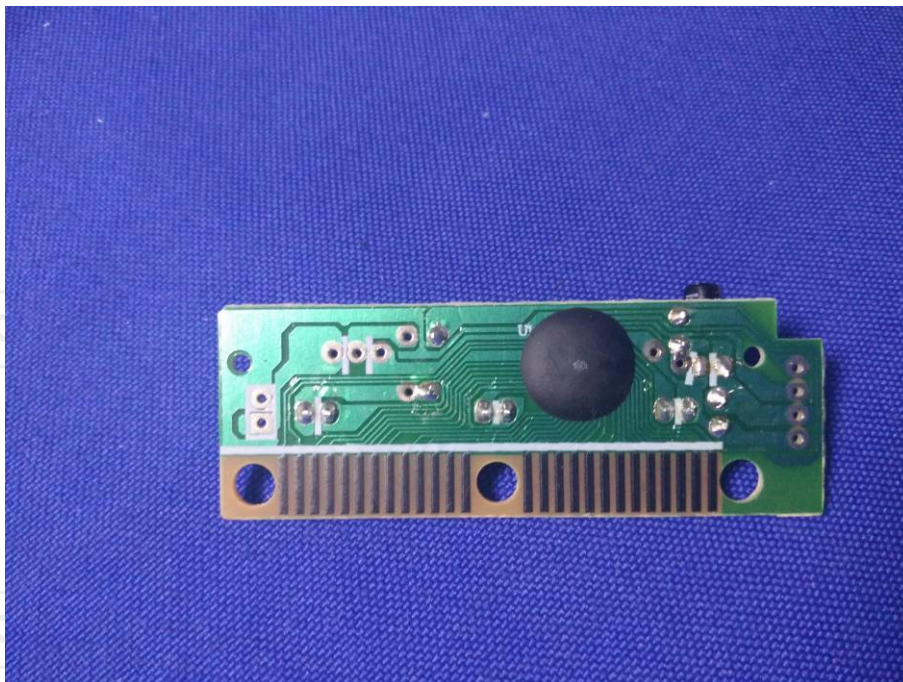
Voltage Dips/Interruptions Test View



10. Photographs of EUT







*******END OF REPORT*******